

AMENDMENTS TO THE CLAIMS

1. (Previously Presented) A control method for a solid state image pickup device having a plurality of photoelectric conversion elements, each of the photoelectric conversion elements being of a type for converting light of each of a plurality of colors into electric charges, a charge read-out region disposed in a column adjacent to each of the photoelectric conversion elements, charge transfer paths disposed adjacent to each column of the charge read-out regions, a mechanical shutter for opening and closing a path of incident light to the plurality of photoelectric conversion elements, and an electronic shutter for clearing electric charges in each of the plurality of photoelectric conversion elements, in which said photoelectric conversion elements, charge read-out regions, charge transfer paths, and electronic shutter are integrated in one semiconductor chip and provided with color filters disposed above said photoelectric conversion elements, the control method comprising:

a preliminary trial image pickup step of forming a preliminary trial image on the semiconductor chip to let the plurality of photoelectric conversion elements generate and accumulate electric charges during a predetermined charge accumulation time and detecting a charge amount corresponding to an intensity of light of each color;

a calculation step of calculating a charge accumulation time of photosensitive conversion elements independently for each color so as to obtain a good white balance, in accordance with the charge amount corresponding to the intensity of light of each color detected by said preliminary trial image pickup step; and

a final image pickup step of controlling the charge accumulation time of photosensitive conversion elements independently for each color by using the electronic

shutter, the mechanical shutter and read-out of electric charges from the photoelectric conversion elements to the charge transfer paths, in accordance with the calculated charge accumulation times, and forming a final image on the semiconductor chip to let the plurality type of photoelectric conversion elements generate and accumulate charges.

2. (Previously Presented) A control method for a solid state image pickup device according to claim 1, wherein said charge read-out regions are capable of transferring electric charges in the photoelectric conversion elements to said charge transfer paths, the plurality type of photoelectric conversion elements are capable of converting light of at least first to third colors into electric charges, and said final image pickup step comprises the steps of:

(a) starting a first charge accumulation time for the first color by the electronic shutter;

(b) reading electric charges from the photoelectric conversion elements of the first color to the charge transfer paths to terminate the first charge accumulation time of the first color;

(c) starting a second charge accumulation time for the first color, a charge accumulation time for the second color and a charge accumulation time for the third color by the electronic shutter;

(d) reading electric charges from the photoelectric conversion elements of the third color to the charge transfer paths to terminate the charge accumulation time for the third color; and

(e) closing the mechanical shutter to terminate the charge accumulation time for the first color and the charge accumulation time for the second color.

3. (Original) A control method for a solid state image pickup device according to claim 2, further comprising the steps of:

(f) reading electric charges from the photoelectric conversion elements of the first color to the charge transfer paths;

(g) transferring the electric charges for the first and third colors on the charge transfer paths;

(h) reading electric charges from the photoelectric conversion elements of the second color to the charge transfer paths; and

(i) transferring the electric charges for the second color on the charge transfer paths.

4. (Previously Presented) A control method for a solid state image pickup device according to claim 1, wherein said charge read-out regions are capable of transferring electric charges in the photoelectric conversion elements to said charge transfer paths, the plurality type of photoelectric conversion elements are capable of converting light of a least first to third colors into electric charges, and said final image pickup step comprises the steps of:

(a) starting a first charge accumulation time for the first color by the electronic shutter;

(b) reading unnecessary electric charges from the photoelectric conversion elements of the second color to the charge transfer paths to initiate a charge accumulation time of the second color;

(c) reading unnecessary electric charges from the photoelectric conversion elements of the third color to the charge transfer paths to initiate a charge accumulation time of the third color; and

(d) closing the mechanical shutter to terminate the first, second and third charge accumulation times.

5. (Original) A control method for a solid state image pickup device according to claim 4, further comprising the steps of:

(e) draining the unnecessary charges for the second and third colors read to the charge transfer paths;

(f) reading electric charges from the photoelectric conversion elements of the first and third colors to the charge transfer paths;

(g) transferring the electric charges for the first and third colors on the charge transfer paths;

(h) reading electric charges from the photoelectric conversion elements of the second color to the charge transfer paths; and

(i) transferring the electric charges for the second color on the charge transfer paths.

6. (Previously Presented) A solid state image pickup device comprising:

a semiconductor substrate;

color filters of red, green, and blue disposed above the semiconductor substrate;

a plurality type of photoelectric conversion elements for converting light of each of red, green and blue colors into electric charges, formed in the semiconductor substrate, the photoelectric conversion elements being disposed in vertical and horizontal directions in a two-dimensional plane;

vertical charge transfer paths for transferring electric charges in the vertical direction, formed in the semiconductor substrate;

read gates for reading electric charges from the photoelectric conversion elements to the vertical charge transfer paths, formed between said photoelectric conversion elements and said vertical charge transfer paths;

a horizontal charge transfer path disposed adjacent to one end of each of the vertical charge transfer paths for transferring electric charges transferred from said vertical charge transfer paths in the horizontal direction;

an electronic shutter formed in said semiconductor substrate for clearing electric charges in the plurality type of photoelectric conversion elements;

preliminary trial image pickup means for forming a preliminary trial image on the semiconductor substrate to let the plurality type of photoelectric conversion elements generate and accumulate electric charges during a predetermined charge accumulation time and detecting a charge amount corresponding to an intensity of light of each color;

calculation mean for calculating a charge accumulation time of photoelectric conversion elements independently for each color so as to obtain a good white balance,

in accordance with the charge amount corresponding to the intensity of light of each color detected by said preliminary trial image pickup means; and

final image pickup means for controlling the charge accumulation time of photoelectric conversion elements independently for each color by using said electronic shutter, said mechanical shutter, and read-out of electric charges from the photoelectric conversion elements to said vertical charge transfer paths, in accordance with the calculated charge accumulation times, and forming a final image on the semiconductor substrate to let the plurality type of photoelectric conversion elements generate and accumulate electric charges.

7. (Currently Amended) A control method for a solid state image pickup device according to ~~claim 1~~ claims 2 or 4, wherein said first, second, and third colors are blue, green, and red, respectively.

8. (Currently Amended) A control method for a solid state image pickup device according to ~~claim 1~~ claims 2 or 4, wherein said first, second, and third colors are red, green, and blue, respectively.